DATAMATION®

DECEMBER 1, 1987
A CAHNERS PUBLICATION

GEARING UP FOR THE NEW NETWORK AGE

Integrating the PBX Into ISDN

PLUS:

DEC TAKES A RISC ON UNIX

THE TOUGH SEARCH FOR TELECOM TALENT

AN INTRODUCTION TO INFORMIX

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DATAMATION

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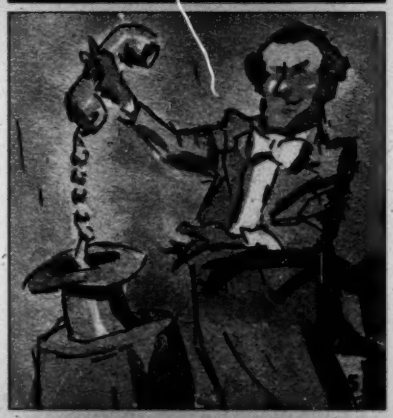

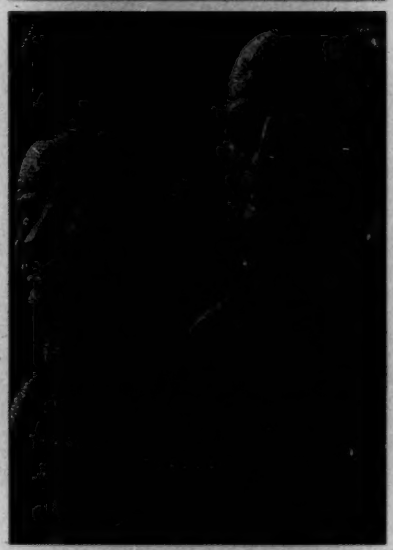

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Editorial

Check for Injuries After the Crash

Information technology has gathered its own momentum, hurtling forward unimpeded by this Fall's stock market crash. At least that is the impression one comes away with from three of the industry's largest and most recent gatherings.

Hours before the second Black Monday dawned in the United States, information systems executives from West German commercial powerhouses were flocking to Systems '87 in Munich, the country's equivalent to NCC in its heyday. They continued their pilgrimage to the Munich Fair Grounds as the week progressed, despite fallout from Wall Street that caused an 11% decline on the Frankfurt stock exchange. Conversations with several West German IS execs focused on competitiveness, not collapsing share prices.

The emphasis shifted to standards and strategies at Telecom '87 in Geneva, also held during the week of the Dow's dizzying drop. Communications vendors and customers attending the quadrennial event had ISDN, X.400, and other important issues on their minds.

Optimism seems to abound in the U.S. also. Last month's Comdex was as upbeat as any in recent years. Noise generated by the availability of 386 technology, the promise of OS/2, and the speed of new modems drowned out discussion of a possible crash-induced downturn in systems spending. Lotus ceo Jim Manzi went so far as to say, "Let the recession be damned."

But impressions can be deceiving. Many of the end users attending the three events admittedly had not finalized their IS budgets for 1988. Many vendors hadn't had direct contact with customers since the crash. That's why DATAMATION is conducting research with Boston brokerage firm Cowen & Co. to assess what damage, if any, the market's collapse is having on IS spending. The initial results will appear in future issues.

In the meantime, we suggest that customers and vendors proceed—with caution. End users should not reduce IS spending just because of the crash. Nor should they avoid determining what effect the stock market's volatility will have on their businesses. Likewise, vendors—especially those that market through indirect channels such as dealers—would be wise to get in touch with reality. They should make every effort to find out whether the business is indeed out there in 1988. If it is, they should go for it. If not, they should manage their businesses as astutely as their customers.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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ABP ABC BPA

Letters

Outstanding

Your 30th anniversary special issue (Sept. 15) does an outstanding job—my heartiest congratulations to you on it.

JOHN DIEBOLD
The Diebold Group Inc.
New York

Assistance

We appreciate the mention of PacTel Spectrum Services in Bill Musgrave's "Network Management: Keeping the Connection" (Sept. 1, p. 98). Overall, Bill does an excellent job of describing PacTel Spectrum Services; however, there was one factual error I would like to address.

The article states that PacTel Spectrum "... isolates problems, reroutes traffic around failures ..." PacTel Spectrum does provide diagnostic and restoral assistance services. The operative word here is "assistance." PacTel Spectrum contacts the appropriate vendor to get a problem resolved quickly. We draw upon information in our comprehensive client database to arm that vendor with the facts that will ensure he arrives ready to address the symptoms of trouble and can quickly find the failed device, even after hours or on holidays. That's what we mean by restoral, not auto-rerouting.

RICHARD A. ANDERSON
PacTel Spectrum Sevices
Walnut Creek, Calif.

Tokenism

Aw, come on folks! One token female, off on the edge, the rest all apparently Caucasian males ... (Oct. 1, cover illustration).

And this is your cover for the annual salary survey?

I am Caucasian, female, and have never before written on such issues. But I've also not recently seen such a blatant misrepresentation of the dp world.

CAROLYN HANKETT
Illinois Dept. of Mental Health
and Developmental Disabilities
Chicago

Misstated?

Your annual salary survey, "What Are You Worth?" (Oct. 1, p. 78) significantly misstates salaries in the San Francisco region. As president of a recruiting firm specializing in the data processing industry, and as a founder of the Association of Data Processing Recruiters, I am well qualified to evaluate and critique your findings.

Although the study was comprehensive and contained a lot of useful and interesting information, the salaries given for the San Francisco region are approximately 20% less than actual salaries.

Systems professionals who might consider a move to our region would be discouraged after seeing your figures. The threat of earthquakes and the high cost of housing is enough to overcome in our recruiting efforts. Don't let deflated salaries also be a hindrance.

Please let your readers know that the San Francisco Bay Area offers a tremendous amount of reward for their professional careers, especially in the form of attractive salaries.

PETER P. JOZWIK
Logical Options Inc.
San Francisco

Red-Faced, No Rouge

Thank you very much for taking an interest in my article for "Readers' Forum" (Oct. 1, p. 145).

However, I've attached a copy of the article and my business card, to show that my first name is *LOUIS* and not *LOUISE*. As for the ribbing I'm taking here at work, well, I wish I could share it.

Could you please provide me with a corrected copy of that page, as I'd like to distribute copies among my coworkers. As it presently reads, I'd have to get a new wardrobe and shave off my beard.

LOUIS E. SCOTT
Protection Mutual Insurance Co.
Park Ridge, Ill.

Untaxed in Rhode Island

"Tax Collectors Eye Custom Software," (Oct. 1, p. 22) incorrectly states that custom software is taxable in Rhode Island.

The Association of Computer Software Companies of Rhode Island has successfully fought this issue. We hope that there will be no changes that would tax this professional service. Certainly, attorneys, accountants, and freelance writers should be taxed if computer programmers are made subject to sales tax.

ROBERT E. RADICAN
President
Network Solutions Inc.
Providence, R.I.

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News in Perspective

STRATEGIES

DEC Moves To Protect Flank With RISC/Unix Workstation

Inroads by Unix vendors have forced DEC into the development of a non-VAX machine, which would be a major departure from its key architecture.

HUGHES'S DAVIS: Unix devotees won't go to VAX as long as the VAX and VMS are inextricably linked.

Photograph by David Smick/Onyx

BY GARY McWILLIAMS

Will the rising influence of Unix force Digital Equipment Corp. to depart from its commitment to one architecture based on the VAX computer family?

It's a question being hotly debated within the company these days, even as DEC prepares what analysts expect to be a final answer—a wild card in the form of a RISC workstation running Ultrix, its own version of Unix. The architectural debate, which has strong support on both sides, has occurred because of defections among VAX engineering users and software developers to other vendors' Unix systems.

As part of that debate, the company is moving forward with a RISC engineering workstation that would create a distinctly Ultrix-based machine that does not run the VMS operating system, DEC's flagship OS.

Long seen only as a perfunctory supporter of Unix, the company recently began promoting Ultrix on an equal footing with VMS. More R&D is invested in Ultrix development than in the VMS kernel, say insiders. A green light for the RISC workstation, expected sometime this month, could give Ultrix the visibility it has sorely lacked. Just as important, analysts say, it could help fend off Unix workstations and minisupercomputer systems that are eroding DEC's engineering and scientific user base. What it also may do is retire the "one architecture" motto that has been the company's standard since 1983, when it canceled the follow-on processor for its 36-bit computer line.

According to insiders, the workstation project is based on a proprietary 32-bit RISC chip set and is proceeding on a fast-track schedule. Using vector instructions to achieve substantially faster floating point performance than today's VAX computers, it is derived from work at the company's Western Systems Research Lab in Palo Alto, and at its DECwest engineering facility in Bellevue, Wash.

Yet, more than introducing a unique architecture, the workstation is being argued as a necessary boost to Ultrix. The company recently assigned Donald J. McInnis, vice president of the engineering systems group, to evaluate its Ultrix position and suggest new approaches. McInnis quickly accelerated the RISC workstation effort.

While a DEC spokesman declined comment on the RISC project, McInnis refuses to rule out an Ultrix-only introduction: "There could always be point products. What we have to do is make those integrate better than anyone else." He says that such a move would not affect VAX/VMS, noting that "some issues will be less important over time. The highly religious issues will be less important."

One reason he suggests for such a scenario is the company's implementation of the

BUCYRUS-ERIE'S JOHNSON: "We're able to do everything with VMS."

X-Windows graphical interface. Future releases of workstation VMS and Ultrix operating systems will share a common user and applications interface, which masks the underlying architectures. Prior efforts to enhance its appeal include moving the VMS FORTRAN, C, and Lisp language compilers to Ultrix.

Must Clear Task Force Hurdle

The groundwork is laid for the RISC project's release, which may be as early as 18 months from now. Before that can happen, it must pass critical muster this month before the Systems Task Force, a high-level management group that has final say over development issues. The task force is headed by William D. Strecker, vice president of product strategy and architecture and the original VAX program manager.

Whatever its decision, the outcome promises to be significant. DEC stuck to the "one architecture" theme even as technical system competitors such as Prime Computer Inc. and IBM in the U.S. and Siemens AG in Europe brought out Unix product lines. To cancel the project now would only reinforce its commitment to a single architecture even as others drop theirs.

The debate over how to approach Unix is as prevalent outside DEC as it is inside the company. Ken Johnson, chief structural engineer at Bucyrus-Erie Co., a Milwaukee-based mining equipment company, says the increasing acceptance of Unix hasn't affected his ambivalence toward the OS. "For a while," he says, "we were thinking we would have to go to Unix" for needed computer aided design software. The company didn't and has no regrets. "There was no point in doing it because we're able to do everything with VMS."

On the other hand, a green light for the RISC workstation could be just the prescription for DEC's lackluster Unix showing. J. Roy Davis, laboratories manager at Hughes Aircraft Co., Long Beach, Calif., says the VAX won't be seriously considered by Unix devotees so long as the VAX and VMS are inextricably linked. "I always mistrust someone with a small percentage of skin in the game. And Digital has very little skin in Unix," says Davis.

The small penetration of Ultrix on VAX computers suggests the sentiment may be widespread. The operating system appears on 20% of the company's VAXstation engineering workstations, says Vicki Brown, senior analyst at International Data Corp., Framingham, Mass. In contrast, Apollo Computer Inc., a Chelmsford, Mass.-based workstation vendor with proprietary and Unix operating systems, claims its Unix version is capturing 70% of new sales. Among larger VAXs, Unix controls an even smaller percentage. Ultrix and other flavors of Unix are represented on just 5% of installed VAX 8000 series computers, according to Computer Intelligence Corp., La Jolla, Calif.

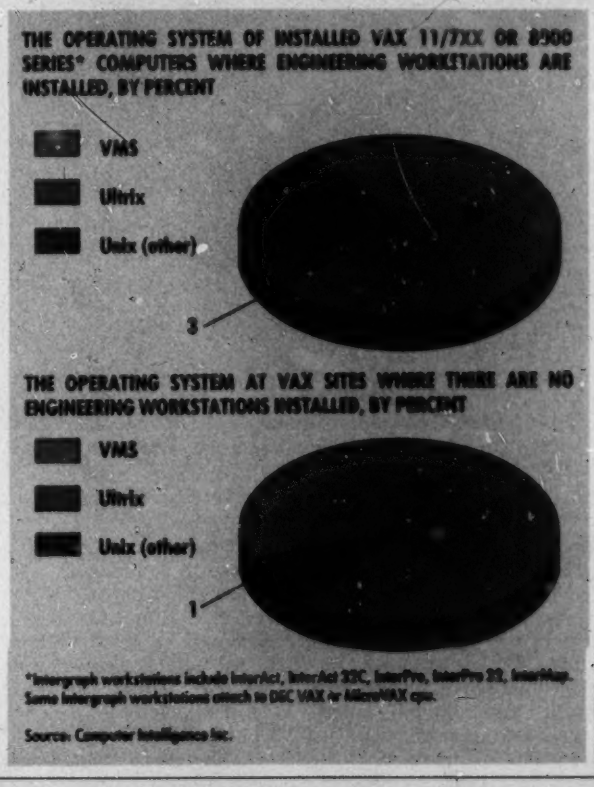
While DEC does not publicly release Ultrix sales, an executive says the IDC figure is "pretty much" in line with internal tallies. Total VAXstation sales and service revenues for the fiscal year ended in June were about $400 million, according to Jim Casey, DEC's U.S. workstations program manager.

What the figures do not show is the rise of Unix and of workstations from Apollo and Sun Microsystems Inc. among VAX users. David Burdick, a vice president at market researcher Dataquest Inc., San Jose, estimates that 75% of Apollo and Sun workstations last year were installed in DEC VAX shops. "They are positively stealing VAX cycles," says Burdick. "If I'm Digital and I see there's maybe $600 million in business I'm missing out on, I've got to do something about it."

A Threatening Gap

According to the 1987-88 DATAMATION/Cowen & Co. mini/micro survey, Unix is becoming a virtual standard for technical workstations, holding an estimated 56% share of existing and planned technical workstations. However, Unix appears on less than 15% of VAX users' computers. The gap threatens

Workstations Spur Use of Unix on VAX


THE OPERATING SYSTEM OF INSTALLED VAX 11/7XX OR 8300 SERIES* COMPUTERS WHERE ENGINEERING WORKSTATIONS ARE INSTALLED, BY PERCENT
VMS
Ultrix
Unix (other)
3
THE OPERATING SYSTEM AT VAX SITES WHERE THERE ARE NO ENGINEERING WORKSTATIONS INSTALLED, BY PERCENT
VMS
Ultrix
Unix (other)
1
*Intergraph workstations include InterAct, InterAct 32C, InterPro, InterPro 32, InterMap. Some Intergraph workstations attach to DEC VAX or MicroVAX cpu.
Source: Computer Intelligence Inc.

Photograph by Scott Wine

software availability for the VAX. For technical applications such as computer aided design and manufacturing, Unix operating systems are expected by 1991 to host the bulk of applications, according to IDC's Brown.

Yet, Ultrix isn't benefiting. For instance, the latest edition of the Ultrix applications catalogue lists only 16 packages for graphics, CAD/CAM, and engineering—only two of which are available on VAXstations. Also, software that was once debuted on VAX/VMS today is appearing first on Unix. "Digital," says Hughes' Davis, "is depending on software to come down [to its VAXstations] from the VAX. There hasn't been a lot of original work for the VAXstation." Davis sees the applications advantage that VMS holds over Unix diminishing. "I see a point in time—maybe two-to-four years from now—when the number of important applications will be equal on Unix and VMS."

Significantly, software developers such as Applicon Inc. (Ann Arbor, Mich.), Auto-Trol Technology Inc. (Denver), Calma Co. (Santa Clara), and Computervision Corp. (Bedford, Mass.) have not migrated their applications to the Ultrix operating system. All have applications for VMS, but employ Apollo, Sun, or proprietary hardware for Unix versions.

Developers Discouraged

The relative low esteem VAX users hold for Ultrix encourages software developers to avoid Ultrix. "We haven't been pushed for Ultrix yet," says Robert McInroy, Auto-Trol's marketing manager for DEC products. While McInroy reports Ultrix is being examined in Auto-Trol's labs, there is no plan to release software for it.

It's a fact that DEC isn't taking lightly. The company is placing a major effort behind recruiting key engineering and CAD/CAM applications for Ultrix, says McInnis. Of the 85 or so graphics-oriented applications available on VMS, "a very small number are available on Ultrix today. Within a year the majority will run on Ultrix."

Some users, such as Hughes's Davis, who oversees both VAX/VMS and Sun's Unix systems, say the time may be ripe to split Ultrix from the VAX. "Digital is getting bigger and more robust," says Davis. "The question is: can it still grow with a single, VMS architecture thrust? I believe as Digital gets more robust it will have to have products in different areas."

Others who expect the workstation emphasis to remain VAX/VMS say that DEC might be forced to avoid some workstation niches—a stance that the company rules out. Charles F. Wise, software unit manager for VAX/VMS fan RCA electronic systems department, predicts DEC's commercial interests will block a price/performance conflict between VAXstations and multiuser VAX computers.

"DEC has a vested interest in minis and superminis. It is not going to build a business in workstations that reduces VAX 8000 sales," says Wise, whose group recently purchased $1 million in VAXstations for a software engineering project. VAXstations may lag behind competitive workstations in performance, but there are other, more important, issues. To him, compatibility with existing software takes precedence.

The performance issue is a delicate one. DEC's Casey says the newly released VAXstation 3200 surpasses 10MIPS workstations in applications benchmarks. A 20-page performance analysis comparing VAXstations to Apollo and Sun workstations is being circulated to refute disparities in published MIPS ratings. Varying demands of technical and commercial VAX users is an issue unlikely to disappear so long as the VAX architecture serves both audiences, say analysts.

Can DEC Continue To Push VAX?

"The workstation state-of-the-art is 7MIPS to 10MIPS" says Dataquest's Burdick. "Next year, it'll be 16MIPS to 20MIPS; the following year, 30MIPS to 40MIPS. Those are the numbers that will be the reality in the workstation world. Given that, how is Digital going to push the VAX architecture?"

Those who think it will be impossible include start-ups targetting high-performance workstation niches. Stellar Computer Inc., Newton, Mass. is one of several companies hoping to lure DEC's scientific engineering customers away with Unix-based workstations featuring high-performance graphics and vector computations.

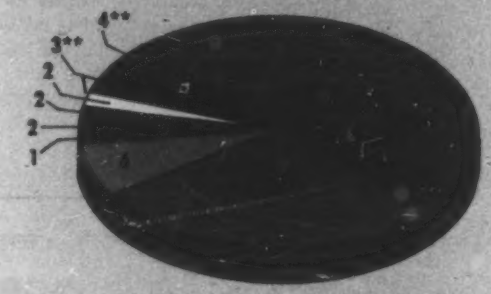
"The fastest VAX today, when they throw everything they can at it—ECL [emitted coupled logic] and what have you—is 6MIPS or 7MIPS," says Ian R.G. Edmonds, Stellar's marketing vice president. "If the goal is to bring VAX to the 10MIPS range at a cost suitable for the workstation world, it doesn't seem to be on the cards."

With so many betting on the VAX to remain the company's sole play before technical workstation users, the RISC workstation could become the unexpected ace DEC pulls from its hat. ■

Sun Leads the Pack Among VAX Sites

BY PERCENT

Among VAX sites, DEC's VAXstation significantly trails those of other suppliers. Determined by units, market share figures include only 1% for the VAXstation. Single-user MicroVAX computers are not counted.



Sun Microsystems
Intergraph
Apollo
McDonnell-Douglas
Applicon
Daisy Systems
GE/Calma
Hewlett-Packard
DEC
Others

*Intergraph workstations include InterAct, InterAct 32C, InterPro, InterPro 32, InterMap. Some Intergraph workstations attach to DEC VAX or MicroVAX cpu.

**Applicon and McDonnell-Douglas market some workstation models that attach to DEC VAX and MicroVAX cpus or are based on the MicroVAX.

Source: Computer Intelligence Inc.

Charts by Sharon Bystrek

Private Sector Systems Integration

HUMANA'S CHAPMAN: A completely automated system never had been done to this extent before.

BY MARY JO FOLEY

To help maintain existing information systems while developing new, state-of-the-art systems, users in the private sector increasingly are adopting the procurement procedures of the federal systems marketplace. General Motors (Detroit), Banc One (Columbus, Ohio), and Humana Inc. (Louisville, Ky.) are among those going the commercial systems integration (CSI) route. They're doing so for a variety of reasons, cost and time savings included.

Private sector users want CSI vendors to provide a wide range of hardware, software, telecommunications products, project management, systems design, integration, implementation, management, and maintenance. Most important, these users are counting on the CSI vendors to "help them pull it all together," explains Stephen McClellan, vp at Merrill Lynch in New York (see "Sorting Out Systems Integration with Stephen McClellan").

Following the federal systems integration (FSI) world's lead, banks, hospitals, railways, insurance companies, and manufacturers are all jumping on the CSI bandwagon. Slowly but surely, the requests for proposals (RFPs) and the contracting and subcontracting teams that are a way of life in today's federal systems marketplace are becoming an integral part of the way Fortune 500 firms are supplying, integrating, and maintaining their IS operations.

So far, the FSI market—with its routine awarding of megacontracts (deals worth $100 million or more) to well-heeled hardware, software, aerospace and defense, and services firms—dwarfs the CSI realm. Nonetheless, the CSI market was worth $1.3 billion last year and could reach $6.5 billion by 1991, according to Input, a Mountain View, Calif., market research firm.

Many of the top players in CSI may sound familiar to those who know the FSI world: IBM, AT&T, Digital Equipment Corp., Electronic Data Systems Corp. (Dallas), Computer Sciences Corp. (El Segundo, Calif.), TRW Inc. (Cleveland), and Boeing Computer Services (Seattle).

Private sector companies—such as hospital chains, manufacturing firms, and banks—increasingly are adhering to the procurement practices of the federal systems integration (FSI) marketplace. Users at the American Red Cross, Banc One, and Humana Inc. are seeking commercial systems integration (CSI) vendors to provide hardware, software, information management, and maintenance. Like their government counterparts, these users have been buying equipment for 30 years but still can't do everything they want to, particularly in terms of integration and real-time processing. They're hoping CSI vendors can help them pull it all together.

Photograph by Patrick L. Pfister, Picture Group

In addition, says Input analyst Richard Peterson, CSI and FSI "are similar in structure, in the things that happen [such as the bidding and awarding processes], in hardware content, and vendor approach.

"But the formality of the federal market is much more strict. For example," he points out, "there are very few sole-source buys in FSI anymore."

RED CROSS'S BLAKE: We don't have to handle the integration ourselves.

Another difference is that RFPs—increasingly required by commercial and federal customers alike—are rarely advertised in the CSI world, whereas FSI bids are open and advertised in advance of the customer's decision date. CSI customers, however, tend to handpick a few top vendors and then issue RFPs.

Private sector customers are seeking integrators, explains Input's Peterson, as increasing domestic and foreign competition results in a growing number of requests by management for "faster real-time information on operations to enhance decision-making and to reduce costs," and "near-constant communications among all company divisions." These increased demands mean that large-scale office automation contracts are prime turf for a CSI approach, as, traditionally, they have been for FSI.

The American Red Cross, for example, selected IBM as prime contractor for an office automation system linking its 190 largest national resource chapters. Commercial customers also are experimenting with CSI solutions in less conventional application areas, ranging from computer integrated manufacturing (CIM) to health care administration to banking/finance to insurance.

Banc One selected Electronic Data Systems Corp. (EDS) to build a new account processing system, which ultimately will replace the bank's process-focused system with one that is customer information focused. In mid-1986, EDS won the Banc One contract, worth "dozens of millions," says Banc One's senior vp of operations Michael Elvir.

The project is still in the planning phase. Elvir says the system could be completed by 1989 or 1990. EDS, the ultimate owner of the system, reportedly plans to license it to other financial institutions. Banc One and another "super-regional" banking group, Norwest Bank NA of Minneapolis—which has, in the meantime, joined Banc One in providing EDS with general banking and customer account processing knowledge—will have free use of the system.

"We felt the project was too big for us to undertake alone," Elvir says. "We considered a bank consortium [approach], but decided there would be too many issues to contend with. We didn't want to be the project managers. It's not that we felt we weren't good at dp, but we're a bank, not a software house."

Banc One chose EDS largely because of its proven track record as a commercial integrator. Elvir explains that EDS "had good experience in large projects, including the government, and had a high degree of self-interest," since they would be the eventual owners of the technology they developed. "They also had deep pockets, and were strong financially," he adds.

Humana Inc., a hospital chain, chose Health Data Sciences Corp. (HDS), San Bernardino, Calif., to develop its extremely complex, second generation hospital-information system. Even though Humana employs an in-house IS staff of nearly 400, a completely automated care delivery system on the scale it envisioned "had never been done in this industry before to this extent," says Richard Chapman, director of IS.

Management wanted to go beyond automating the chain's administrative and financial functions—a task it already had achieved via the Medpro system it purchased from HBO & Co., Atlanta. It then wanted to automate and integrate its entire record-keeping and patient information systems.

Humana began its request for information process in 1982. By 1985, it had narrowed its selection to a handful of vendors, including HBO, Control Data Corp., IBM, and HDS. HDS was chosen because its Ulticare product, while not totally finished, had many of the features that Humana wanted. Claims Chapman, "Had we not gone with HDS, we probably would have had to do it ourselves."

Humana's IS department is writing some of the interface and reporting programs that will link the new system, called Medcom, with Medpro. It also is aiding in the design process and plans to do the entire installation, Chapman says. HDS, a Data General value-added reseller, is providing the superminicomputers, terminals, networking and peripheral equipment, and most of the software, in addition to overseeing the rest of the contract. The completion date for the entire project is planned for either March or April 1988.

Photograph by Teresa Zabala/Picture Group

Hundreds, if not thousands, of other CSI projects are in the works, both inside and outside of the United States. Because of the competitive advantage that customers expect to gain as a result of CSI, relatively few are either willing or able to talk specifics, such as dollar value, terms of the contracts, and target completion dates.

EDS acknowledges that it is engaged in major CSI contracts at General Motors (EDS's parent corporation), K-Mart, Northwest Airlines, Shell Oil in Brazil, Isuzu in Japan, and Lucky GoldStar Group in South Korea. In what could be the first CSI megacontract, EDS is expected to sign a $100 million (or larger) systems integration deal with a leading, large Japanese industrial firm by the end of 1987, claims Merrill Lynch's McClellan.

Another CSI vendor, Computer Partners Inc., a wholly owned subsidiary of Computer Sciences Corp., counts among its customers AT&T, Morse Shoe Inc., the West German railway system, the British Department of Inland Revenue, and the British Department of Health and Social Security. For these customers, Waltham, Mass.-based Computer Partners is providing consulting and systems development services. These range from the enhancement and maintenance of a complex circuit-provisioning system for network systems planning for AT&T to the integration of freight management systems to help achieve just-in-time delivery for the West German Railways.

IBM Is Well Represented in CSI

IBM—which earlier this year made public its CSI plans—has a lengthy and impressive CSI customer list itself, according to the management and computer consultancy International Technology Group, in Los Altos, Calif. ITG counts Chrysler, Equitable Life, Ford, GM, Texaco, Wells Fargo, United Airlines, and Sears, Roebuck & Co. among IBM's CSI clients.

At least one IBM CSI customer, the American Red Cross, is willing to detail its CSI project. Primarily, this openness comes because the Red Cross's goal is greater in-house efficiency rather than having to concern itself with any competitive advantage.

According to Charles Blake, vp for corporate management IS, the Red Cross has installed the micro-based LAN system that IBM has devised for the organization at 15 pilot sites. The system consists of IBM PS/2s, XTs, and ATs, Zenith pcs, and other IBM-compatibles linked using IBM's Token Ring networks and Novell Inc.'s Advanced NetWork 286 product. The systems are running a programmable read-only memory version of the Total Office Management integrated word processing, spreadsheet, and electronic mail package. The Red Cross plans to develop "hundreds" of its own customized applications.

THE CSI MARKET WAS WORTH $1.3 BILLION LAST YEAR.

Blake is unwilling to disclose the total value of the contract, but he acknowledges that the organization received a discount of between 30% and 38% from IBM. The Red Cross uses the RFP process for all contracts over $25,000 to prevent alienating any potential corporate donors.

The Red Cross appreciates the simplicity of working with one vendor. "By going through a single company," Blake elaborates, "we don't have to take care of the integration ourselves." Besides, he points out, "we wouldn't have the same clout with the smaller vendors [subcontractors such as Novell] as IBM does."

IBM has a novel approach to the CSI market. It plans to channel its CSI business through one of two organizations: its Federal Systems Div. or its Information Services/ Professional Services organization. If neither option is deemed appropriate, IBM's Customer Sector Organization—which oversees CSI—will designate a preapproved value-added reseller, a marketing assistance program (MAP) participant, or a CSI partner to fulfill a particular contract. IBM is concentrating on applications like CIM, in-house publishing, office automation, image scanning, and branch bank automation.

Arthur Andersen & Co., Chicago, on the other hand, is handling most of its CSI business through CIM experts within its Management Information Consulting Div. The Big Eight accounting firm is targeting vertical niches, like aerospace and defense, electronics, automotive and other repetitive-manufacturing industries, and the process industry. "We're trying to focus on both functional and technical integration," says Roger Willis, a partner at the firm.

Regardless of their marketing and organizational approach, the bottom line for CSI vendors is convincing customers that the potential benefits of employing CSI outweigh the costs and drawbacks. There are risks, Input's Peterson acknowledges. Some multimillion-dollar systems may fail to perform as promised. Completion target dates may be underestimated by some months or even by years. Customers that do not participate in each step of the CSI process may lose control of their systems, resulting in a substantially curtailed ability to maintain and upgrade them. ■

U.S. Commercial Systems Integration Market Share

COMPANY	1986 SALES ($ MILLIONS)	PERCENT
IBM*	470	28
Arthur Andersen	220	13
EDS	120	7
AT&T	55	3
Control Data Corp.	50	2
Digital Equipment Corp.	37	2
Computer Sciences Corp.	30	2
TRW Inc.	27	1
Systems Control	12	less than 1
Boeing Computer Services	8	less than 1
Subtotal	1,029	60

*Includes nonfederal sales by IBM's Federal Systems Div.

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Prototyping: Orchestrating For Success

BY TOR GUIMARAES

At a multibillion-dollar transportation company, seven end users spent six months and $250,000 prototyping a 500-program carrier management system. The price was right. The system, which runs on a pc-based local area network, is returning profits by managing 5,000 trucks for two major clients.

A utilities company in the East used prototyping and fourth generation facilities to write 10 major high-volume applications in just two years. The productivity improvement in lines of documented, quality-assured, and user-accepted code written was 13-to-one over what they had ever been able to achieve using COBOL.

Prototyping as an "insurance policy for success" in systems development gained academic favor in the late '70s and early '80s. And as the cases above illustrate, the concept has been proven in practice. After nearly 10 years, the industry is discovering that there are a number of ways to make prototyping music. Not all of them, however, are right.

This was one major conclusion of a field study of 48 Fortune 1000 companies that was conducted by the Business Computer Information Systems Dept. at St. Cloud State University in Minnesota. Interviews with these firms, all of which have committed substantial resources to prototyping, revealed that users are just beginning to understand the best ways to use this systems development tool.

Illustration by Mike Ng

Approaches to prototyping are proliferating, and some of them can yield huge benefits, says a study of 48 Fortune 1000 companies conducted by St. Cloud State University. The narrow view of prototyping as a quick-and-dirty, throwaway development solution is giving way to the long-term orientation of evolutionary prototyping and formal, enforced methodologies, as IS discovers that what is lost in speed can be gained in lasting effectiveness. End users are making their voices heard, and for some firms, the sound is music.

FIGURE 1 Prototyping Ends and Means

BY NUMBER OF FIRMS

OPERATIONAL OBJECTIVES	THROWAWAY PROTOTYPING	KEEP-IT PROTOTYPING
User Interface Development	48	33
Functional Development	48	33
Machine Performance Evaluation	23	26
Application Development	48	31

PROTOTYPING TOOLS	QUICK-AND-DIRTY	FORMAL, ENFORCED METHODOLOGY
End-user 4GLs	32	16
IS 4GLs	13	14
Autocode Generators	3	13
Embedded 4GLs	2	7

Increasingly, IS departments are employing a variety of approaches to prototyping, for a variety of reasons (see "Prototypes and Their Purposes" and Figure 1). Our study found that firms generally practice one or more of eight different forms of prototyping. Two basic approaches—throwaway (i.e., the information is kept, but the coding is junked) or keep-it prototyping (the prototype is kept and maintained in a traditional manner)—are employed for four fundamental purposes:

- to define the user interface,
- to define the process or functional requirements,
- to model complex design configuration alternatives, and
- to develop a full-blown application.

It is rare that a company will limit itself to only one approach, although there are those with a very narrow view of prototyping. In such firms, it is often the case that politically powerful systems development groups with well-established development methodologies insist that prototyping is solely a vehicle for systems requirements definition, and that all such prototypes are to be thrown out and redeveloped through traditional means, despite the fact that enormous amounts of labor and money are sacrificed in the process.

Quick-and-dirty prototyping with no formal methodology is also creating trouble at some companies. Problems arise with this approach because undocumented prototypes that were intended to be thrown away are kept, and become the poorly planned bases for large, complex systems that are consequently difficult to use and maintain.

Another prototyping problem these firms have encountered is that all too often the end user has been left out of the equation. Prototyping is an iterative process for developing systems that first and foremost must involve and be controlled by the end user. And they've forgotten that it may take a few iterations to get it done right.

There are several apparent reasons for these prototyping problems: lack of awareness of alternative approaches to prototyping, a limited set of prototyping tools and personnel, lack of management support for prototyping experimentation, or systems developers who are unwilling to change or to try new ways.

As Figure 1 indicates, all 48 companies use the throwaway approach for most purposes. But why do they practice such an expensive and inefficient policy? Many insist that prototypes are a quick way of establishing information requirements and are not an integral part of systems development, which should be done with tried-and-true methodologies that are oriented to quality and care.

Away with Throwaways

Consider the fact that an end user or programmer spends anywhere from a few hours to a few hundred hours developing a prototype. He or she then passes it along to the systems development group, which extracts the information on user requirements, tosses out the code, and sits down to do development the traditional way. The wastefulness is clear.

The prototyping practice of one Chicago bank provides a good measure of throwaway losses. End users spent an average of 250 hours developing each throwaway prototype (primarily requirements definition) for a group of six large applications. They then invested an average of 45 hours more per prototype on working with systems developers to add other procedures. The systems development group itself expended between 75 and 225 hours repeating what had already been done in the prototype. Thus, the bank supported efforts that were between 30% and 90% redundant.

Through careful planning and discipline, prototypes can be integrated into the development process. The utility company in our example would not have been able to develop 10 major applications in two years with the throwaway approach. Teams of end users and systems developers evolved the major applications through multiple iterations. They planned and prepared to evolve the prototypes into final, documented, quality-assured programs. This cooperative, disciplined effort ensured that end-user requirements were defined and met, and all tenets of good systems development were followed.

Very few situations technically justify throwaways. In most cases, the reasons for throwaways are due to basic underlying problems with computing in the organization, such as lack of integration of systems development resources, lack of cooperation between prototypers and traditional systems development groups, lack of training and support for prototypers, or incompatible software packages and development languages (e.g., the end-user prototype is done in Lotus 1-2-3, but the application is part of a mainframe system).

Despite the prevalence of quick-and-dirty, throwaway work, the study showed that a growing number of companies are doing keep-it prototyping (ap-

proximately two thirds of this group) and many are adopting formal, enforced methodologies for prototyping (approximately one third). More and more IS managers are learning to integrate prototyping effectively into their systems development life cycle (SDLC) methodology. It's not an easy process to adopt, requiring trade-offs between prototyping's fast approach to development and the long-term orientation of most SDLC methodologies.

Managers are also employing evolutionary prototyping for applications development. With this comprehensive method, the whole system—user interfaces, processing functions, error control and handling, documentation, etc.—is developed through prototyping and is cut over to operations as any system would be.

Prototyping proponents who thought the method would do away with documentation, project management, and the systems development life cycle itself are beginning to realize that just the opposite is true. But when systems development groups are too firmly entrenched in their old methodologies, change is more difficult. The transportation company mentioned earlier had a successful prototyping project, but it was an end-user project; IS people weren't involved. In fact, the firm's IS organization isn't using prototyping at all and two poles are developing: conservative IS and liberated end users.

The company was fortunate in that the seven end users developing its carrier management system were "paraprofessionals," proficient in the software tools they needed (dBase III for user interfaces and FORTRAN for process requirements) and aware of the quality and documentation requirements. They have in fact become a second MIS group within the company.

Prototyping Made Easier

A wide variety of software development tools have contributed to effective prototyping. These tools may be classified under four basic types: fourth generation languages for end users (such as Focus, RAMIS, AS, and Nomad), fourth generation languages for information systems professionals (such as ADS/Online, Ideal, Mantis, and Natural), automatic code generation facilities, and embedded language facilities.

While the end-user facilities are easier to learn and much less procedural, their nonprocedural nature may ultimately restrict programming flexibility for systems developers. In addition, systems produced by means of these facilities are likely to be relatively slow at execution time and may cause severe response-time deterioration for other systems. But as we have seen, end-user participation in systems development is critical, and the limitations inherent in end-user tools must be complemented by other facilities.

Fourth generation facilities for IS professionals are not likely to be user friendly, but they provide much more programming flexibility and permit a great deal of intimacy with the machine. This intimacy is an important feature in the development of prototypes that are to be kept and executed often, thus making machine performance a major consideration. While some companies have trained end users in the use of these facilities for specific tasks such as screen painting and report generation, they are primarily used by IS personnel.

Automatic code generation facilities for COBOL or other third generation languages are exclusively in the domain of the IS pro. While they are valuable for rewriting some of the vast number of applications done in COBOL or for applications

Prototypes and Their Purposes

One of the most common reasons for prototyping is to provide a vehicle for more effectively defining systems information requirements. In the planning stage, many projects allow for a clear separation of the user interface (screens, reports, etc.) from the functions necessary to input data or to produce the data items for the screens and reports. Because of this, many companies develop prototypes to define the user interfaces for the system—which is called user interface development (UID) prototyping—or to define the processing or functional requirements—which is called functional development (FD) prototyping. Or they may develop prototypes with combined objectives.

The "silly empty shell" problem is one commonly associated with UID prototyping. For an end user, this means that a system's impressive-looking user interface lacks the processing needed to support it. Coordinating the completion of UID prototypes and their corresponding functions must be timed carefully to minimize this problem.

Provided this coordination is achieved, the major advantage of UID prototyping is that while end users or information center personnel are working on the user interface, IS professionals can be developing the functions concurrently. Thus, development is speeded up and people are deployed doing what they do best.

In FD prototyping, actual processing is done, producing information. The primary risk associated with this type of prototyping is that a prototype originally intended as a throwaway, quick-and-dirty solution is retained—often because of the will of a powerful user manager—and becomes the basis of a large, complex system that is expensive to operate and maintain. Such systems may contain incorrect algorithms and may process invalid data, with little provision for backup and recovery.

In situations where systems developers are unable to see through complex design alternatives, building a prototype to model particular design configurations can be a great advantage. The primary objective of this type of prototyping—machine performance evaluation (MPE)—is the determination of response times and/or memory requirements associated with various design alternatives that involve different numbers of files, file sizes, transaction processing approaches, physical database designs, or communications volume.

One of the few cases where throwaways are justifiable is MPE prototyping. It is less expensive to model the specific design aspects that are problematic than to develop alternative versions of the system. In MPE prototyping, the model is likely to be so incomplete that it will be discarded after the problem is resolved.

Applications development prototyping encompasses the user interfaces, the functions, and, in some cases, all other elements necessary to produce a full-blown system. In applications development, often a particular application cannot be easily decomposed into user interfaces and functional components. The prototypes for such applications actually represent combinations of the UID, FD, and MPE prototypes. In addition to employing applications development prototypes for large, monolithic applications, prototypes for small systems also tend to be developed in this fashion, since there is little benefit to breaking down small systems into components.

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where coding represents a substantial part of the development effort, they are not useful for new prototype versions when requirements are unstable. Since automatic code generators need detailed systems design information to produce code, translating these shifting requirements into detailed design specifications becomes a cumbersome task.

Embedded 4GL facilities are also tools for IS professionals. These tools enhance programming flexibility by embedding nonprocedural or semiprocedural 4GL statements in 3GL programs. For applications that are developed using substantial amounts of 3GL programming, however, systems development productivity usually suffers with this approach compared with what can be achieved through exclusive use of IS fourth generation facilities.

While our study found that firms are employing a variety of fourth generation facilities for prototyping, end-user and IS

END-USER PARTICIPATION IN PROTOTYPING IS CRITICAL.

fourth generation facilities—when they are properly matched to the application at hand—are the most common, as well as the most effective, prototyping tools.

But beyond the right complement of tools, the firms achieving the greatest prototyping success are those that are discovering the right complement of end user and IS professional cooperation. The key to the utility company's success was to have teams of end users and developers working together closely.

Unfortunately, such consonance is still the exception, not the rule. But as the richness of the prototyping concept unfolds, more IS players will trade their johnny-one-note, throwaway tunes for harmonies with end users. The orchestrations invariably create more effective systems. ■

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